

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR PATENT

ON

IMPROVED CIRCUIT CARD RETAINING SYSTEM

BY

FRANK LIEBENOW

## IMPROVED CIRCUIT CARD RETAINING SYSTEM

### FIELD OF THE INVENTION

[0001] The present invention generally relates to the field of circuit card retention  
5 where a printed circuit card is inserted into a connector and is retained by a secondary component which impedes inadvertent disengagement of the card, or the like.

### BACKGROUND OF THE INVENTION

[0002] Printed circuit cards with edge connectors or other forms of connectors  
10 are widely used in many electronic products. These cards may be used to configure additional capability to an otherwise standard system. For example, in many Personal Computer (PC) systems, various card standards exist to allow the manufacturer or end user to add features and capabilities to the computer. These standards include, but are not limited to, PCI (Personal Computer Interconnect) cards, ISA (Industry Standard Adapter)  
15 cards, Micro-Channel cards, Card Bus cards, PCMCIA cards and newer standards, such as 3GIO (3<sup>rd</sup> Generation I/O) cards. Some of these cards have connectors mounted on the edge that mates with a connector on a different printed circuit card within the PC. Some of these cards have contacts, called fingers, on their edge, collectively called edge connectors. These cards insert into connectors mounted on another printed circuit card  
20 within the system or PC, such as a motherboard.

[0003] In general, these upgrade cards are sometimes held in place by a bracket at one end of the card. Usually, this bracket is the same bracket that additionally has connectors to interface with external components. For example, if the upgrade card is a  
25 Video Graphics Card, then the bracket may contain a graphics port, possibly utilizing the Video Graphics Adapter (VGA) standard. Even with this bracket and the use of a screw, there exists an industry problem whereas these upgrade cards become unseated from the connector on the second printed circuit card causing systems to malfunction or to not operate. Shock and vibration can cause the upgrade card to at least partially lift out of the  
30 connector and lose contact on one or more of its fingers. A prevalent symptom of this happening are PC systems that fail when delivered to customers due to shipping shock

and vibration, exhibiting symptoms such as “no-video” when the graphics adapter becomes loose or “no-modem” when the modem becomes loose.

5 [0004] In the prior art, several attempts have been made to hold the upgrade cards in place, especially during shipping. Some attempts include a strap passing over the card, and positioning a stop material on the equipment cover that pushes down on the card to keep it in place.

10 [0005] Another approach has been to employ a rigid clip that attempts to lock the card to the connector that it is inserted into. One example of such a rigid clip system 100 is depicted in FIG. 1 of the drawings, which shows an adapter card 110 with a rigid clip assembly 140, 150 and 160. The rigid clip assembly 140, 150 and 160 consists of three components: a support member 140; a riser member 150, and a connector interface member 160. The support member 140 is affixed to the adapter card 110. When the  
15 adapter card is fully mated with connector 120, the interface member 160 of the rigid clip assembly engages a lip 130 of a connector 120 into which the adapter card is inserted, and shouldn't easily separate from connector 120 when shock or vibration occurs. The connection interface member 160 and the lip 130 each have a contacting surface, and the contacting surfaces of the respective parts contact each other when the interface member  
20 160 engages the lip 130. Each of the contacting surfaces lies in a plane that is oriented perpendicular to the surface of the adapter card 110, so that simple lateral movement of the interface member 160 with respect to the lip 130 releases the member 160 from the lip 130 and the adapter card 110 is free to move out of the connector 120.

25 [0006] This known clip structure is somewhat effective in reducing the likelihood that the adapter card 110 will become inadvertently dislodged from the connector 120. However, since simple lateral movement of a lower portion of the riser member 150 that carries the interface member 160 can release the member 160 from the lip 130 (which can result simply from flexing of the support member 140), there is still an appreciable  
30 chance that jostling during shipping or other movement of the PC will result in the adapter card 110 being dislodged from the connector 120.

[0007] The present invention is an improvement upon the latter structure that provides greater resistance to inadvertent release of the adapter card from the connector.

#### SUMMARY OF THE INVENTION

5 [0008] The present invention is directed to a clip assembly that is attached to the upgrade or option card, whereas the clip assembly is coupled to the same connector that the upgrade or option card is inserted into and whereas the clip assembly holds the upgrade or option card in place, and impedes the upgrade or option card from moving out of the connector when shock and vibration occur, while still being releasable by finger  
10 pressure applied to the appropriate location on the clip assembly.

[0009] The prior art structures rely upon friction alone between the clip assembly and a lip formed on the connector to hold the card in place. Since both the clip assembly and the lip are often made from plastic, the amount of friction present therebetween is  
15 usually minimal, and this often allows the clip assembly to slip out of engagement with the lip under certain shock or vibration scenarios. The present invention improves upon the prior art by incorporating an angled first catch surface at the point where the clip assembly engages an angled second catch surface on the connector so that the clip assembly is engaged with the connector, and in turn the upgrade or option card on which  
20 the clip assembly is mounted is more effectively held in engagement with the connector.

[0010] It is to be understood that both the foregoing general description and the following detailed description are exemplary only and are not restrictive of the invention as claimed. The general functions of this invention may be combined in different ways to  
25 provide the same functionality while still remaining within the scope of this invention. Various combinations of connectors and upgrade cards may be used without veering from the intent of this invention. Throughout this description, the term upgrade card is used to represent a printed circuit card that has a connector or fingers that mate with a connector or fingers on a different printed circuit card. This type of card is known to one skilled in  
30 the art as an option card, a daughter card, an option card, an upgrade card, or the like. Likewise, the printed circuit that has a connector or fingers that the upgrade card plugs into may be known as a "motherboard," but this invention is not limited by this.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The numerous advantages of the present invention may be better understood by those skilled in the art by reference to the accompanying figures in which:

5 [0012] FIG. 1 shows a side view of the prior art.

[0013] FIG. 2 shows a side view of an adapter card according to the present invention with the improved rigid clip.

## 10 DETAILED DESCRIPTION

[0014] Reference will now be made in detail to the presently discussed embodiment of the invention, an example of which is illustrated in the accompanying drawing.

15

[0015] Referring now to **FIG. 2**, a retaining system 200 in accordance with the present invention is shown. The retaining system 200 may be implemented on a first circuit card, which may be described as an add-on, or an adapter, card 210. The adapter card 210 typically includes a surface or face 212 that may generally define a reference plane. The adapter card 210 typically has an edge portion or region that forms a first connector 214, and this first connector portion of the card 210 may be provided with a plurality of electrical contacts. A second circuit card 216, which in some embodiments of the invention forms a motherboard of a computer, includes a second connector 220. The first connector 214 of the adapter card 210 may be mated with the second connector 220 by inserting the first connector 214 into a slot formed in the second connector 220 in a movement that is generally parallel to the reference plane.

25

[0016] The retaining system 200 includes a substantially rigid clip assembly 235. The clip assembly 235 may include three components: a support member 240, a riser member 250, and a first catch member 260. Optionally, all three components of the clip assembly 235 may be molded as one piece from the same material, or may be separate components that are bonded together. The support member 240 of the clip assembly 235

30

is affixed to the adapter card **210**. The support member **240** may be attached by adhesive, glue, rivet, screw or any means known to the industry.

5           [0017] The second connector **220** on the second circuit card **216** has a second catch member **230** that engages with the first catch member **260** of the clip assembly **235** when the first connector **214** is fully seated in the second connector **220**. The second catch member **230** may extend along, and generally parallel to, a length of the second connector **220**.

10           [0018] In a significant aspect of the invention, the first catch member **260** has a first catch surface **262** that is oriented at a first catch member angle that may be measured with respect to various structures, including with respect to the reference plane of the adapter card **210** or with respect to an extent of the riser member **250**. While the reference plane of the adapter card **210** and the riser member **250** may often be  
15           substantially parallel, the first catch member angle as referred to herein will be made in reference to the reference plane of the adapter card **210**, or a plane oriented parallel to the reference plane which would result in the same relative angle measurement.

          [0019] In exemplary embodiments of the invention, the first catch member angle  
20           is an interior angle of less than 90 degrees. The first catch member angle may be different than that depicted in **FIG. 2**. The first catch member angle may be relatively large, for example, 89 to 85 degrees, or it may be anywhere in the range of slightly less than 90 degrees to as little as 70 degrees. Some exemplary ranges for the first catch member angle: 89 degrees to 85 degrees; 85 degrees to 80 degrees and 80 degrees to 75  
25           degrees. In some instances, the present invention may be configured with the first catch member angle measuring less than 70 degrees to help prevent the adapter card **210** from separating from its connectors due to extreme shock or vibration.

          [0020] In another significant aspect of the invention, the second catch member  
30           **230** has a second catch surface **232** that is oriented at a second catch member angle with respect to the reference plane of the face **212** of the adapter card **210**. The second catch surface **232** is thus positioned such that when engaged with the first catch surface, the

first catch member **260** cannot easily slide off of the second catch member **230** merely by overcoming any friction between the catch surfaces **232**, **262**. The second catch member angle associated with the second catch member **230** may be substantially the same as the first catch member angle of the first catch member **260** so that the orientations of the surfaces **232**, **262** are complementary. Optionally, the second catch member angle of the second catch surface **232** may be slightly less than the first catch member angle of the first catch surface **262** to promote a better grip between the second catch member **230** and the first catch member **260**.

[0021] Once the first connector **214** of the adapter card **210** is sufficiently inserted into the second connector **220** (such as, for example, to achieve electrical communication between the contacts of the first and second connectors), the first catch member **260** rests next to the second catch member **230** of the second connector **220**. During the installation process, placing slight downward pressure on the riser member **250** causes the support member **240** to flex slightly, allowing the leading edge of the first catch member **260** to pass beyond the leading edge of the second catch member **230** and mate appropriately. Once in this position, the first catch member **260** doesn't easily separate from the second catch member **230** when shock or vibrations occur.

[0022] Significantly, the orientation of the first catch surface **262** at a first catch member angle of less than 90 degrees and the second catch surface **232** at a second catch member angle of less than 90 degrees generally creates a hooked (and generally interlocked) relationship or condition therebetween when the first catch member **260** and the second catch member **230** are engaged with each other and the first connector **214** is fully seated in the second connector **220**. This hooked or interlocked condition of the first catch member **260** and the second catch member **230** is not undone simply by lateral outward movement of the first catch member **260** with respect to the second catch member **230**, such as might easily occur during jostling experienced by the computer during shipping. To undo the hooked condition of the first catch member **260** and the second catch member **230** requires that the first catch member **260** not only move laterally outward from the second catch member **230**, but also in the general direction of the second connector **220** and generally toward the motherboard **216** on which the second

connector **220** is typically mounted. In this way, the shape of the first catch member **260** and the second catch member **230** (and the respective orientations of the first **262** and second **232** catch surfaces) may actually force the riser member **250** to also move toward the second connector **220**, as well as, depending upon the rigidity of the support member **240**, the adapter card **210** itself. Thus, dislodging of the second catch member **260** from the first catch member **260** may require that the first connector **214** of the adapter card **210** itself move deeper into the slot of the second connector **220**. As a result, accidental dislodgement of the first connector **214** of the adapter card **210** from the second connector **220** is made more difficult, and less likely. Moreover, movement of the adapter card **210** outwardly from the second connector **220** actually increases or intensifies the hooked relationship between the first catch member **260** and the second catch member **230**, leaving the first **260** and second **230** catch members more strongly engaged.

[0023] The second catch member **230** can be made of the same material as the case of the second connector **220**, or it may be fabricated separately and affixed in various ways including an adhesive or bonding agent. The support member **240** may be fabricated of a material such as plastic or metal that is somewhat flexible yet after releasing pressure, restores to substantially its original shape, thereby allowing pressure to be exerted to engage the catch and after pressure is released, the first catch member **260** raises so that it fully engages with the second catch member **230**.

[0024] Although the invention has been described with a certain degree of particularity, it should be recognized that elements thereof may be altered by persons skilled in the art without departing from the spirit and scope of the invention. It is believed that the improved circuit card retaining system of the present invention and many of its attendant advantages will be understood by the forgoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the components thereof without departing from the scope and spirit of the invention or without sacrificing all of its material advantages, the form herein before described being merely an explanatory embodiment thereof, and further without



providing substantial change thereto. It is the intention of the claims to encompass and include such changes.